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Resume  
THOMAS J. ALEY

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*PERSONAL DATA*

Born September 8, 1938 in Steubenville, Ohio. U.S. Citizen. Married. two children.

*EDUCATION*

University of California, Berkeley. B.S. in Forestry (1960).

University of California, Berkeley. M.S. in Forestry with emphasis in forest influences and wildland hydrology. (1962).

University of California, Berkeley. Department of Geography (1962-1963); emphasis in hydrology and geology.

University of Arizona, Tucson. Department of Watershed Management (1963-1964); emphasis in wildland hydrology.

Southern Illinois University, Carbondale. Department of Geography (1972-1973). Emphasis in hydrology and geology.

*PROFESSIONAL CERTIFICATION*

Professional Hydrogeologist, Certificate Number 179, American Institute of Hydrology. Board of Registration. Granted 1983.

*PROFESSIONAL SOCIETY MEMBERSHIPS*

American Institute of Hydrology  
Association of Ground Water Scientists and Engineers  
Missouri Water Pollution Control Association  
National Speleological Society  
National Water Well Association

*HONORS AND AWARDS*

1960. Pack Prize in Forestry. University of California.  
1961. Membership in Xi Sigma Pi, honorary forestry society.  
1972. Award for outstanding performance, United States Forest Service.  
1972. U.S. Forest Service nominee for the American Motors Conservation

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Award.

1973. Lester B. Dill Award for significant contributions to speleology. Mississippi Valley-Ozark Region of the National Speleological Society.

1977. Chairman's Conservation Award. Mississippi Valley-Ozark Region of the National Speleological Society.

1979. J Harlan Bretz Award for outstanding contributions to the study of speleology in the state of Missouri. Missouri Speleological Survey.

1981. Outstanding Service to Education Award. Phi Delta Kappa honorary educational fraternity for southwest Missouri.

1981. Fellow. National Speleological Society.

EMPLOYMENT HISTORY

1973 to Present. Director. Ozark Underground Laboratory, Protem, Missouri. Conducts or directs consulting and contract studies in hydrogeology, cave and karst related issues, and natural resource management of karst regions.

1966 to 1973. Hydrologist. United States Forest Service. Winona, Missouri and Springfield, Missouri. Directed the Hurricane Creek Barometer Watershed study, which assessed the interactions of land use and ground water hydrology in a forested karst area. Directed Grey Hollow study. Conducted "trouble shooting work" in Missouri, Arkansas, Wisconsin, Utah, Illinois, and Indiana. Left government service as GS-12.

1964 to 1966. Chief Hydrologist. Toups Engineering, Inc., Santa Ana, California. Duties included basic data collection and analysis for plaintiffs in Santa Ana Basin adjudication and similar work for defendants in San Gabriel Basin adjudication; these were both ground water basin adjudication suits. Directed technical work on ground water basin management and artificial recharge.

1963 to 1964. Teaching Assistant. Department of Watershed Management, University of Arizona, Tucson. Aerial photogrammetry and photo interpretation.

1963. Researcher, grant from Office of Naval Research, U.S. Navy, through Department of Geography, University of California, Berkeley. Conducted field studies on the origin and hydrology of caves in Jamaica, Haiti, and the Dominican Republic. Responsible for all field work. Work resulted in 3 publications.

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1960 to 1963. Teaching Assistant and Research Assistant, School of Forestry, University of California, Berkeley. Teaching in aerial photogrammetry, photo interpretation, and forest influences. Research assistant in the same fields.

1958. Camp Manager, University of California forestry summer camp (Associated Forestry Students). Managed all business affairs.

1967. Crewman, U.S. Forest Service, McCloud, Calif. Timber stand improvement and fire crew.

*SUMMARY OF EXPERIENCE*

24 years of professional experience in ground water and surface water hydrology, pollution control investigations, and land management issues with particular emphasis on soluble rock landscapes. The following projects are representative examples.

1. Hydrologic studies for land management and spring protection with particular emphasis on soluble rock regions. Several studies of this type have been conducted for local, state, and federal agencies in Missouri, Arkansas, Alabama, Kentucky, and Wyoming.
2. Expert witness testimony on pollution potential of underground injection of hazardous wastes into deep-lying soluble rocks in Oklahoma.
3. Expert witness testimony in ground water and surface water hydrology in Missouri, Arkansas, Oklahoma, California, Alabama, and Indiana.
4. Expert witness testimony on riverbank stability problems in Missouri before U.S. Senate Committees at request of Senator John Danforth of Missouri.
5. Member of 6-man review panel on the adequacy of testing to determine radionuclide migration from a radioactive waste disposal site at the Idaho National Engineering Laboratory, Idaho. Served as the only hydrogeologist on the panel.
6. Hydrologic consultant to St. Charles County, Missouri on clean-up of radioactive wastes at Weldon Spring Site, a former Atomic Energy Commission processing facility. Advised on actions to protect county well field from radioactive contaminants dumped in an abandoned quarry.

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7. Ground water tracing in soluble rock landscapes, and delineation of recharge areas for spring systems. Work conducted in Missouri, Arkansas, Indiana, Illinois, California, Wyoming, and Alabama. Ground water tracing in fractured rock landscapes in New Mexico and Washington.
8. Hydrologic investigations to determine subsurface sources for nitrates and other nitrogenous compounds found in wells and springs. Missouri and Oklahoma.
9. Hydrogeologic investigations along a fertilizer pipe line across the state of Missouri and part of Oklahoma.
10. Hydrologic investigations to determine sources of pollutants which caused fish kills at three fish farms in Missouri and Arkansas.
11. Hydrogeologic site investigations (and sometimes testimony) on municipal landfills with emphasis on site suitability and probability of ground water contamination. 17 sites in Arkansas, Missouri, Wisconsin, and Alabama.
12. Hazardous waste remediation investigations with emphasis on hydrogeology. Sites in Missouri, Arkansas, and Kentucky. Second opinion review of projects in Missouri and Kansas.
13. Impacts of food processing wastes on surface and ground water quality. Various projects in Arkansas and Missouri.
14. Hydrologic investigations of gasoline pollution of wells. Four sites in Missouri and Arkansas.
15. Assessment of the hydrologic impacts of proposed geothermal energy development on the Santa Clara Indian Reservation, New Mexico.
16. Investigations on the extent and sources of sewage contamination in about 100 springs at Eureka Springs, Arkansas. Work involved the delineation of recharge areas for most of these springs and the identification of sewer line segments which had the greatest leakage problems.
17. Hydrogeologic hazard area mapping for proposed sewer line corridors in a sinkhole plain area south of Mammoth Cave, Kentucky. Work included hydrologic recommendations for minimizing exfiltration and monitoring strategies.
18. Hydrogeologic mapping of Greene County, Missouri to identify areas where sinkhole flooding and serious ground water contamination could result from land development.

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19. Development of a quantitative assessment system for locating and designing septic field systems which will protect ground water supplies in Greene County, Missouri.
20. Assessment of impacts of proposed highways on springs, caves, and endangered cave-dwelling species, Arkansas.
21. Identification and delineation of rare, threatened, and endangered animal species' habitats in caves and ground water systems. Studies in Arkansas, Missouri, and Alabama.
22. Mapping and microclimate studies in an endangered species habitat cave subject to flooding from a man-made lake. As a result, an artificial entrance which creates minimal adverse impacts on the cave microclimate and on the bats has been constructed. Arkansas.
23. Health and safety assessment of Harrison's Crystal Cave, Barbados.
24. Health and safety assessment of natural radiation as encountered in caves open to the public in the United States. Development of industry standards.
25. Various microclimate, hydrologic, biologic, interpretive, and management investigations of caves in Missouri, Arkansas, Tennessee, Kentucky, New Mexico, Arizona, California, Wyoming, Oregon, and British Columbia.
26. Evaluation of 16 sites for designation as National Natural Landmarks; sites were in Indiana, Missouri, Arkansas, Iowa, and New Mexico.
27. Assessment of hydrologic impacts of rock quarries. Four sites in Missouri.
28. Pre-purchase hydrologic assessment of lands to detect the presence of hazardous wastes or other hydrogeologic risks. Two sites in Missouri.
29. Assessment of the impacts of deep mining on regional hydrology. Missouri.
30. Preparation of sole-source aquifer designation petition. Missouri.
31. Delineation of wellhead protection zone for a public water supply well in Arkansas.
32. Feasibility study for creation of an American Cave and Karst Center.

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PUBLICATIONS

1. \_\_\_\_\_. 1962. Analytical review of Gurnee, Russell; Richard Anderson; Albert C. Mueller; and Jose Limeras. 1961. Barton Hill Project; a study of the hydrology of limestone terrain. *National Speleological Society Bulletin*. Vol. 23, Part I. 30p. Review in *Cave Notes*, Vol. 4:4, pp. 32-33.
2. \_\_\_\_\_. 1963. Water balances for limestone terrain. *Cave Notes*, Vol. 5:3, pp. 17-22.
3. \_\_\_\_\_. 1963. Basic hydrographs for subsurface flow in limestone terrain: theory and application. *Cave Notes*, Vol. 5:4, pp. 26-30.
4. \_\_\_\_\_. 1964. Sea caves in the coastal karst of western Jamaica. *Cave Notes*, Vol. 6:1, pp. 1-3.
5. \_\_\_\_\_. 1964. Echnoliths--an important solution feature in the stream caves of Jamaica. *Cave Notes*, Vol. 6:1, pp. 3-5.
6. \_\_\_\_\_. 1964. Origin and hydrology of caves in the White Limestone of north central Jamaica. Dept. of Geography, Univ. of Calif., Berkeley. 29p.
7. \_\_\_\_\_. 1965. Corrasional cave passage enlargement. *Cave Notes*, Vol. 7:1, pp. 2-4.
8. \_\_\_\_\_. 1965. Analytical review of Brown, R.F. and T.W. Lambert. 1963. Reconnaissance of ground-water resources in the Mississippian Plateau region of Kentucky. *U.S. Geol. Surv. Water Supply Paper* 1603. 58p. Review in *Cave Notes*, Vol. 7:2, pp. 9-13.
9. Crooke, Howard W., John M. Toups, and \_\_\_\_\_. 1965. Ground water recharge means "progress insurance" in Orange County, California. *Water and Sewage Works*, Vol. 112:7, pp. 257-261.
10. \_\_\_\_\_. 1967. Analytical review of Sweeting, M. M.; G. E. Groom; V. H. Williams; C. D. Pigott; D. Ingle Smith; and G. T. Warlock. 1965. Denudation in limestone regions; a symposium. *Geographical Journal*, Vol. 131, Part 1, pp. 34-57. Review in *Caves and Karst*, Vol. 9:1, pp. 5-6.
11. \_\_\_\_\_. 1967. Water balance study of Greer Springs, Missouri. *Caves and Karst*, Vol. 9:2, pp. 12-15.

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12. \_\_\_\_\_. 1967. Analytical review of White, William B. and Victor A. Schmidt. 1966. Hydrology of a karst area in east-central West Virginia. *Water Resources Research*, Vol. 2:3, pp. 549-560. Review in *Caves and Karst*, Vol. 9:5, pp. 44-46.
13. \_\_\_\_\_. 1968. Hydrology of a karst watershed in the Missouri Ozarks. *Caves and Karst*, Vol. 10:6, pp. 49-55.
14. \_\_\_\_\_. 1969. Out of sight, out of mind. *Missouri Mineral Industry News*, Vol. 9:12, pp. 163-166.
15. \_\_\_\_\_. 1970. Temperature fluctuations at a small Ozark spring. *Caves and Karst*, Vol. 12:4, pp. 25-30.
16. \_\_\_\_\_. 1972. The sinkhole dump and the spring. *Missouri Conservationist*, Vol. 33:2, pp. 16-17.
17. \_\_\_\_\_. 1972. Groundwater contamination from sinkhole dumps. *Caves and Karst*, Vol. 14:3, pp. 17-23.
18. \_\_\_\_\_. 1972. Control of unwanted plant growth in electrically lighted caves. *Caves and Karst*, Vol. 14:5, pp. 33-35.
19. \_\_\_\_\_, James H. Williams, and James W. Massello. 1972. Groundwater contamination and sinkhole collapse induced by leaky impoundments in soluble rock terrain. *Engineering Geology Monographs*, Series 5. Missouri Geol. Survey and Water Resources. 32p.
20. \_\_\_\_\_. 1974. Groundwater problems in southwest Missouri and northwest Arkansas. *Missouri Speleology*, Vol. 14:2, pp. 1-13.
21. \_\_\_\_\_. 1975. Hydrology. IN: Gott, J. D. Soil survey of Mark Twain National Forest Area, Missouri. U.S. Dept. of Agric. Soil Survey Report, pp. 47-50.
22. \_\_\_\_\_. 1976. Caves, cows, and carrying capacity. *Proc. First National Cave Management Symposium*, pp. 70-71.
23. \_\_\_\_\_. 1976. Hydrology and surface management. *Proc. First National Cave Management Symposium*, pp. 44-45.
24. \_\_\_\_\_ and Mickey W. Fletcher. 1976. The water tracer's cookbook. *Missouri Speleology*, Vol. 16:6, pp. 1-32.
25. \_\_\_\_\_ and Doug Rhodes; Editors. 1977. *Proc. Second National Cave Management Symposium*, 106p.
26. \_\_\_\_\_. 1977. Comments on cave radiation. *Proc. Second National Cave Management Symposium*, pp. 75-76.

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27. \_\_\_\_\_. 1977. Introductory comments on commercial and high value caves. *Proc. Second National Cave Management Symposium*, pp. 52-53.
28. \_\_\_\_\_. 1977. The Ozark Underground Laboratory. *Proc. Second National Cave Management Symposium*, pp. 94-98.
29. \_\_\_\_\_. 1977. A model for relating land use and groundwater quality in southern Missouri. *IN* Dillamarter, R. R. and S. C. Csallany, Editors. Hydrologic problems in karst regions. Western Kentucky Univ. Press, pp. 323-332.
30. \_\_\_\_\_. 1977. The Ozark Underground Laboratory. *IN* Sloane, Bruce; Editor. Cavers, caves, and caving. Rutgers Univ. Press, pp. 140-158.
31. \_\_\_\_\_. 1977. Springs and sewage. *IN* Sloane, Bruce; Editor. Cavers, caves, and caving. Rutgers Univ. Press, pp. 318-329.
32. \_\_\_\_\_. 1978. A predictive hydrologic model for evaluating the effects of land use and management on the quantity and quality of water from Ozark springs. *Missouri Speleology*, Vol. 18, 185p.
33. Harmon, R.S.; H.P. Schwarcz, and \_\_\_\_\_. 1978. Isotopic studies of speleothems from a cave in southern Missouri, U.S.A. *IN*: Zartman, Robert E. (Editor). Short Papers of the Fourth Intern'l. Conf. on Geochronology, Cosmochronology, and Isotope Geology. U.S. Geol. Surv. Open File Rept. 78-701.
34. \_\_\_\_\_ and Catherine Aley. 1979. Prevention of adverse impacts on endangered, threatened, and rare animal species in Benton and Washington Counties, Arkansas. Northwest Arkansas Regional Planning Commission, Springdale, 35p.
35. \_\_\_\_\_ and David I. Foster. 1979. Deep secrets and dark problems; studies of karst springs in the Ozark National Scenic Riverways. *Proc. Second Conference on Scientific Research in the National Parks*, Vol. 6. pp. 499-506. U.S. National Park Service.
36. \_\_\_\_\_. 1979. Do threatened and endangered species threaten or endanger commercial interests at show caves? *Down Under*, Vol. 14:2, pp. 24-26.
37. \_\_\_\_\_ and Kenneth C. Thomson. 1981. Hydrogeologic mapping of unincorporated Greene County, Missouri, to identify areas where:



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sinkhole flooding and serious groundwater contamination could result from land development. Mo. Dept. of Natural Resources, map folio and project summary.

38. \_\_\_\_\_ and Danny Halterman. 1982. A conceptual characterization of the subsurface movement of toxic chemicals in soluble rock lands. *Proc. Fifth National Cave Management Symposium*, pp. 77-80.

39. \_\_\_\_\_. 1982. Hydrologic impacts of urbanization in the soluble rock lands of Greene County, Missouri. *Proc. Fifth National Cave Management Symposium*, pp. 61-69.

40. \_\_\_\_\_ and Cathy Aley. 1982. Interpretive training for show cave personnel. *Proc. Fifth National Cave Management Symposium*, pp. 91-92.

41. \_\_\_\_\_. 1984. Groundwater tracing in water pollution studies. *National Speleological Society Bulletin*, Vol. 46:2, pp. 17-20.

42. \_\_\_\_\_. 1985. Optical brightener sampling; a reconnaissance tool for detecting sewage in karst groundwater. *Hydrological Science and Technology Short Papers*, Vol. 1:1, pp. 45-48.

43. \_\_\_\_\_. Cathy Aley, and Russell Rhodes. 1986. Control of exotic plant growth in Carlsbad Caverns, New Mexico. *Proc. Sixth National Cave Management Symposium*, pp. 169-171.

44. \_\_\_\_\_ and Cathy Aley. 1986. Effects of land management on cave and water resources, Dry Medicine Lodge Creek Basin, Bighorn Mountains, Wyoming. *Proc. Sixth National Cave Management Symposium*, pp. 79-92.

45. \_\_\_\_\_. 1988. Complex radial flow of ground water in flat-lying residuum-mantled limestone in the Arkansas Ozarks. IN PRESS. *Proc. Second Environmental Problems in Karst Terranes and Their Solutions Conference*, National Water Well Association, Nashville, Tennessee. 12p.

46. \_\_\_\_\_. James F. Quinlan, and James Vandike. 1988. The joy of dyeing; a compendium of ground water tracing techniques. National Water Well Association, IN PREPARATION.

PAPERS PRESENTED AT PROFESSIONAL MEETINGS

1. \_\_\_\_\_. 1965. Water balance study of Greer Springs, Missouri. Cave Research Meeting, Flagstaff, Arizona.

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2. \_\_\_\_\_. 1967. Hydrology of a karst watershed in the Missouri Ozarks. Cave Research Meeting, Branson, Missouri.
3. \_\_\_\_\_. 1969. Effects of vegetation on spring flow regimes in the Ozarks. National Speleological Society Annual Meeting, Springfield, Missouri.
4. \_\_\_\_\_. 1971. Karst hydrology investigations in the Missouri Ozarks. Cave Research Meeting, Hamilton, Ontario, Canada.
5. \_\_\_\_\_ and J. H. Williams. 1971. Sinkhole collapse induced by changes in valley groundwater regimens. 14th Annual Meeting, Association of Engineering Geologists, Portland, Oregon. October, 1971. T. Aley, presenter.
6. \_\_\_\_\_. 1975. Caves, cows, and carrying capacity. First National Cave Management Symposium, Albuquerque, New Mexico.
7. \_\_\_\_\_. 1975. Hydrology and surface management. First National Cave Management Symposium, Albuquerque, New Mexico.
8. \_\_\_\_\_. 1976. Relationships between land use and water quality of large springs in the southern Missouri Ozarks. International Symposium on Hydrologic Problems in Karst Regions, Bowling Green, Kentucky.
9. \_\_\_\_\_. 1976. Comments on cave radiation. Second National Cave Management Symposium, Mountain View, Arkansas.
10. \_\_\_\_\_. 1976. Introductory comments on commercial and high value caves. Second National Cave Management Symposium, Mountain View, Arkansas.
11. \_\_\_\_\_. 1979. Deep secrets and dark problems: studies of karst springs in the Ozark National Scenic Riverways. Second Conference on Scientific Research in the National Parks, San Francisco, California.
12. \_\_\_\_\_. 1980. A conceptual characterization of the subsurface movement of toxic chemicals in soluble rock lands. Fifth National Cave Management Symposium, Mammoth Cave, Kentucky.
13. \_\_\_\_\_. 1980. Hydrologic impacts of urbanization in the soluble rock lands of Greene County, Missouri. Fifth National Cave Management Symposium, Mammoth Cave, Kentucky.
14. \_\_\_\_\_. 1980. Interpretive training for show cave personnel. Fifth National Cave Management Symposium, Mammoth Cave, Kentucky.

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15. \_\_\_\_\_. 1981. Hydrogeologic mapping of water contamination hazard areas to guide land use decisions in soluble rock landscapes. Geological Society of America Annual Meeting, Cincinnati, Ohio.
16. \_\_\_\_\_. 1981. Problems with water resources interpretation. Association of Interpretive Naturalists Annual Meeting, Branson, Missouri.
17. \_\_\_\_\_. 1982. Evaluation of movement of toxic substances in groundwater systems in areas underlain by limestone or dolomite. Missouri Water Pollution Control Association Annual Meeting.
18. \_\_\_\_\_. 1982. Interactions of the surface and subsurface in cave management. Eighth Northwest Symposium of Cave Science and Technology. Boise, Idaho.
19. \_\_\_\_\_. 1984. Hazardous waste hydrology beyond the limits of mathematical modeling. American Institute of Hydrology Annual Workshop, Washington, D.C.
20. \_\_\_\_\_. 1984. Ground water contaminants. Missouri Society of Professional Sanitarians, Gravois Mills, Missouri.
21. \_\_\_\_\_. 1984. Effects of land management on cave and water resources, Dry Medicine Lodge Creek basin, Bighorn Mountains, Wyoming. National Cave Management Symposium, Rolla, Missouri.
22. \_\_\_\_\_. 1984. Control of exotic plant growth in Carlsbad Caverns, New Mexico. National Cave Management Symposium, Rolla, Missouri.
23. \_\_\_\_\_. 1985. Optical brightener sampling; a reconnaissance tool for detecting sewage in karst ground water. American Institute of Hydrology Annual Workshop, Minneapolis, Minnesota.
24. \_\_\_\_\_. 1988. Water quality studies. Second Annual Watershed Conference, Springfield, Missouri.

ADVISORY COMMITTEES AND RELATED ACTIVITIES

- Sierra Club, Grand Canyon Task Force, 1963-65.  
Meeting Chairman, Cave Research Meeting, Flagstaff, Arizona, August, 1965.  
Meeting Chairman, Cave Research Meeting, Branson, Missouri, August, 1967.  
Missouri Water Resources Advisory Committee, University of Missouri. 1970 to about 1978. Review and advise on project and funding

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allocations for water resources research for all campuses of the University.

Board of Directors, Missouri Chapter of The Nature Conservancy. 1970-73.

Sierra Club, National Water Resources Advisory Committee. 1971 to 1973.

Consultant on the educational film "Cave Ecology" made by Centron Educational Films, Lawrence, Kansas. 1971.

Assistant Editor, *Cave Studies*, Vol. 13. Karst hydrology of the lower Maligne Basin, Alberta. 1972.

Consultant to Wolper Associates and the National Geographic Society on television documentary "Strange Creatures of the Night", 1972-73.

Co-chairman of the hydrogeology portion of the North Central Section of the Geological Society of American meeting, Columbia, Missouri, April, 1973.

Consultant to Time-Life books on "The Ozarks", a book in the American Wilderness Series. 1973.

Advisor to Time-Life books on revision of "Snake River Country", a book in the American Wilderness Series. 1976.

Member, Program Directorate for the Analysis of a Cave Ecosystem. University of Missouri at Kansas City and the National Science Foundation. 1972-73.

Member, Environmental Advisory Board, City of Springfield. Appointed by City Council. 1974-76.

Advisor to Time-Life books on "Underground Worlds", a book in the Planet Earth Series. 1982.

Consultant on educational film "Caves, a Deeper Look at our Earth." About 1984.

Technical Session Coordinator and Proceedings Editor. Second National Cave Management Symposium, Mountain View, Arkansas. 1976.

Session Moderator ("Response to Spills of Hazardous Materials in Karst Terrane"), Environmental Problems in Karst Terranes and Their Solutions Conference. National Water Well Association, Bowling Green, Kentucky. 1986.

Session Secretary (Hydrology Session). International Congress of Speleology, Bowling Green, Kentucky. 1981.

Panel Member on Hazardous Waste Panel. "Current and Future National Water Problems and Issues as Related to Hydrology". American Institute of Hydrology Workshop, Washington, D.C. 1984.

Panel Member on Applied Hydrology Panel. "Selected Problems and Solutions in Applied Hydrology and Hydrogeology". American Institute

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of Hydrology Workshop, Minneapolis, MN. 1985.

Board of Directors, American Cave Conservation Association.  
1985-1988.

*TEACHING AND LECTURING*

1973. Taught college course in Ground Water Resources at School of the Ozarks, Point Lookout, Missouri. 3 semester hour course.

1974 and 1975. Instructor in 5 week "Student Science Training Program in Cave Ecology and Groundwater Contamination Problems". Course conducted once per year. Drury College through a grant from National Science Foundation.

1980. Instructor in professional short-course on land application of municipal wastewaters. University of Missouri, continuing engineering education. Columbia, Missouri.

1985. Instructor in professional short-course in cave management sponsored by National Speleological Society and the American Cave Conservation Association. Salt Lake City, Utah. A similar session was taught at Elkins, West Virginia.

1985. Instructor in professional short-course in cave management sponsored by the National Park Service. Van Buren, Missouri. A similar session was taught at Carlsbad, New Mexico.

1986. Instructor in professional short-course in cave management sponsored by American Cave Conservation Association. Horse Cave, Kentucky.

1986, 1987, 1988. Instructor in professional short-course "Karst Hydrogeology and Practical Ground Water Monitoring". Sponsored by Association of Ground Water Scientists and Engineers, National Water Well Association. Park City, Kentucky. Taught once each year.

1986. Lecturer at Regional Conference on Caves and Land Development, Austin, Texas. City of Austin et al.

1987. Instructor in professional short-course in cave management sponsored by the United States Forest Service, Vancouver, Washington.

1988. Instructor in professional short-course in cave management sponsored by the U.S. Bureau of Land Management, Cody, Wyoming.